

ORIGINAL ARTICLE

Enteric-coated aspirin use in acute chest pain in Saudi Arabia: a cross-sectional study of practice patterns and system-level implications

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ABSTRACT

Objective: This study aimed to assess aspirin formulation use for acute chest pain in emergency departments and primary care centers in Saudi Arabia, with a focus on Ministry of Health facilities.

Methods: A cross-sectional, anonymous, convenience-based electronic survey was conducted among the healthcare professionals involved in the care of patients with acute chest pain in the Ministry of Health emergency departments and primary care centers. The survey assessed aspirin formulation, dose, and method of administration, as well as knowledge regarding enteric-coated aspirin absorption, availability of non-enteric aspirin, and willingness to change practice.

Results: A total of 58 participants, most of whom worked in emergency departments (79.3%) and were emergency physicians (74.1%), were included. Enteric-coated aspirin was reported as the most commonly used formulation for acute chest pain (57%), most often administered by swallowing the tablet whole (58.6%), and 69.0% of participants were aware that enteric-coated aspirin has delayed absorption. Only 32.8% reported that non-enteric aspirin formulations were readily available in their facility. In exploratory analyses, enteric-coated aspirin use was more commonly reported when non-enteric aspirin was unavailable than when it was available (81.8% vs. 31.6%; Fisher's exact test, $p = 0.0016$). A large majority of participants indicated willingness to use non-enteric aspirin if available (81.0%) and supported system-wide standardization of non-enteric aspirin use (77.6%).

Conclusion: Enteric-coated aspirin was commonly used for acute chest pain in surveyed Ministry of Health settings in Saudi Arabia despite guideline recommendations favoring non-enteric formulations. This practice appeared to be influenced by system-level factors, particularly medication availability, more than by knowledge alone.

Keywords: Enteric-coated aspirin, acute chest pain, Saudi Arabia, cross-sectional study, practice patterns, system-level implications.

Introduction

Aspirin administration is a foundational component of early management for patients presenting with acute chest pain and suspected acute coronary syndrome. Clinical guidelines consistently recommend the use of non-enteric, chewable, or soluble aspirin formulations because they provide faster absorption and earlier platelet inhibition in time-sensitive clinical settings [1-3].

Enteric-coated aspirin, while widely used for chronic cardiovascular prevention, is associated with delayed

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absorption and delayed pharmacologic effect. This delay may persist even when enteric-coated tablets are chewed or crushed, potentially limiting their effectiveness in acute presentations [4-7]. Despite this pharmacokinetic disadvantage, enteric-coated aspirin appears to remain in use in some acute care settings.

In Saudi Arabia, emergency and primary care services are delivered across a diverse healthcare landscape that includes Ministry of Health facilities, governmental health systems, and private providers. As the largest healthcare provider in the country, the Ministry of Health plays a major role in shaping clinical pathways, medication formularies, and procurement practices. Acute coronary syndrome remains an important cause of morbidity in the region, yet the extent to which aspirin formulation use in acute chest pain aligns with evidence-based recommendations in Saudi healthcare settings has not been well described [8,9].

Medication availability, procurement processes, and institutional formularies are increasingly recognized as important determinants of clinical practice, sometimes exerting greater influence than clinician knowledge alone [10-12]. Understanding these system-level contributors is essential for effective quality improvement and medication standardization. However, data examining aspirin formulation use and the factors influencing this practice in Saudi Arabia remain limited.

This study aimed to assess aspirin formulation use for patients presenting with acute chest pain in emergency departments and primary care centers in Saudi Arabia, with a focus on Ministry of Health facilities. Secondary objectives were to evaluate clinician awareness of delayed absorption associated with enteric-coated aspirin, assess the availability of non-enteric formulations, and identify system-level factors influencing aspirin selection. By characterizing current practice patterns, this study seeks to inform health system-level strategies to improve medication standardization and patient safety in the Saudi healthcare context.

Subjects and Methods

This was a cross-sectional, anonymous, survey-based study conducted across the Ministry of Health emergency departments and primary care centers in Saudi Arabia. The study population included healthcare professionals involved in the care of patients with acute chest pain, including emergency physicians, primary care physicians, nurses, and clinical pharmacists.

Eligible participants were licensed healthcare professionals currently working in Ministry of Health emergency departments or primary care centers who voluntarily agreed to participate in the survey. Patients, non-clinical staff, and incomplete survey responses were excluded.

A structured questionnaire was developed by the investigators to assess current aspirin use practices and system-level factors influencing aspirin formulation selection. The questionnaire was developed based on existing literature on aspirin pharmacokinetics, acute coronary syndrome guidelines, and prior studies

examining barriers to guideline implementation. It was reviewed for clarity and content validity before distribution, but it was not formally psychometrically validated.

The survey included items addressing clinical setting and professional role, years of clinical experience, aspirin formulation commonly used for acute chest pain, aspirin dose and method of administration, awareness of delayed absorption associated with enteric-coated aspirin, availability of non-enteric aspirin formulations, reasons for enteric-coated aspirin use, willingness to change practice, and support for standardization. The survey was designed to be completed in approximately 3-5 minutes. No personal identifiers or facility identifiers were collected.

The survey was administered electronically using Google Forms and distributed through institutional and professional communication channels used by clinicians in the Ministry of Health emergency departments and primary care centers. Participation was voluntary. An information statement was provided at the beginning of the survey, and completion of the questionnaire constituted implied consent.

Because the survey link was distributed through group-based communication channels and may have been secondarily shared, the exact number of eligible healthcare professionals who received the survey could not be determined. As a result, a formal response rate could not be calculated. Data collection occurred over a defined study period and was closed after 58 complete responses were obtained.

Survey responses were exported from Google Forms into a spreadsheet for analysis. Responses were reviewed for completeness, and all completed surveys were included. Analyses were primarily descriptive in nature. Categorical variables were summarized using frequencies and percentages. In addition, exploratory bivariate analyses were performed to examine associations between selected variables, including reported availability of non-enteric aspirin and the aspirin formulation most commonly used, as well as awareness of delayed absorption and reported aspirin formulation. For these analyses, responses of “not sure” were excluded, and Fisher’s exact test was used because of small cell sizes. These analyses were considered exploratory given the modest convenience sample. A *p*-value of 0.05 was considered statistically significant.

Results

A total of 58 healthcare professionals completed the survey. Most participants worked in emergency departments (79.3%), and the majority were emergency physicians (74.1%). Participants represented a broad range of clinical experience, with 20.7% reporting less than 5 years of experience, 34.5% reporting 5-10 years, 29.3% reporting 11-20 years, and 15.5% reporting more than 20 years of experience (Table 1).

Enteric-coated aspirin was reported as the most commonly used formulation for acute chest pain by 33 participants (56.9%), while 20 participants (34.5%) reported use of

Table 1. Participants' characteristics.

Characteristic	Frequency (Percentage) n (%)
Practice setting	
Emergency department	46 (79.3)
Primary care center	6 (10.3)
Both ED and primary care	2 (3.4)
Other	4 (6.9)
Professional role	
Emergency physician	43 (74.1)
Primary care physician	5 (8.6)
Nurse	5 (8.6)
Clinical pharmacist	3 (5.2)
Other	2 (3.4)
Years of clinical experience	
< 5 years	12 (20.7)
5-10 years	20 (34.5)
11-20 years	17 (29.3)
> 20 years	9 (15.5)

Table 2. Aspirin use for acute chest pain.

Variable	Frequency (Percentage) n (%)
Aspirin formulation most commonly used	
Enteric-coated aspirin	33 (56.9)
Chewable aspirin	20 (34.5)
Not sure	5 (8.6)
Aspirin dose administered	
81 mg	3 (5.2)
160-162 mg	4 (6.9)
300-325 mg	50 (86.2)
Not sure	1 (1.7)
Method of administration	
Swallowed whole	34 (58.6)
Chewed	20 (34.5)
Variable/not sure	4 (6.9)

chewable aspirin; 5 participants (8.6%) were unsure of the formulation used (Table 2).

Most participants (86.2%) reported that a 300-325 mg dose is commonly administered for acute chest pain. Aspirin was most often administered by swallowing the tablet whole (58.6%), while 34.5% reported that it is typically chewed (Figure 1).

Chart data embedded in the editable chart excludes the 0% category:

Response	Percentage
Enteric-coated aspirin	56.9%
Chewable aspirin	34.5%
Not sure	8.6%

Most participants (69.0%) indicated awareness that enteric-coated aspirin has delayed absorption compared with non-enteric formulations in acute coronary syndromes. However, 43.1% believed that chewing or crushing enteric-coated aspirin eliminates this delay.

Only 32.8% of participants reported that non-enteric aspirin formulations, such as chewable or soluble aspirin, were readily available in their facility pharmacy. The most frequently cited reason was limited availability, with 25 participants indicating that enteric-coated aspirin was the only available formulation (Table 3).

A substantial majority of participants (81.0%) indicated that they would prefer to use non-enteric aspirin for patients with acute chest pain if it were readily available. Similarly, 77.6% supported standardization of non-enteric aspirin use for acute chest pain across Ministry of Health facilities (Figure 2).

Editable data embedded in the chart:

Response	Percentage
Yes	81%
No	5.2%
Not sure	13.8%

In exploratory analyses excluding participants who selected "not sure," reported availability of non-enteric aspirin was associated with the aspirin formulation most commonly used. Among participants who reported that non-enteric aspirin was unavailable, 81.8% reported enteric-coated aspirin as the most commonly used formulation, compared with 31.6% among those who reported that non-enteric aspirin was available (Fisher's exact test, $p = 0.0016$). By contrast, awareness that enteric-coated aspirin has delayed absorption was not significantly associated with the formulation most commonly used. Enteric-coated aspirin was reported by 55.3% of participants who were aware of delayed absorption and by 80.0% of those who were not aware or were unsure (Fisher's exact test, $p = 0.123$).

Discussion

This cross-sectional survey found that enteric-coated aspirin remains commonly used for acute chest pain in surveyed Ministry of Health settings in Saudi Arabia, despite guideline recommendations favoring non-enteric formulations in acute coronary syndromes [1-5]. More than half of the participants reported enteric-coated aspirin as the most commonly used formulation, and aspirin was more often reported to be swallowed whole rather than chewed. In the setting of enteric-coated aspirin, this practice might further delay absorption and onset of action in time-sensitive presentations.

An important finding of this study was that the observed practice pattern does not appear to be explained by a lack of clinician willingness to change alone. Most participants were aware that enteric-coated aspirin has delayed absorption, and a large majority indicated that they would prefer to use non-enteric aspirin if it were available. Similarly, most participants supported the standardization of non-enteric aspirin use for acute chest pain. Taken together, these findings suggested that the continued use of enteric-coated aspirin might be influenced more by system-level constraints than by clinician preference alone [10,11].

This interpretation was supported by exploratory analyses. Reported use of enteric-coated aspirin was substantially more common among participants who reported that non-

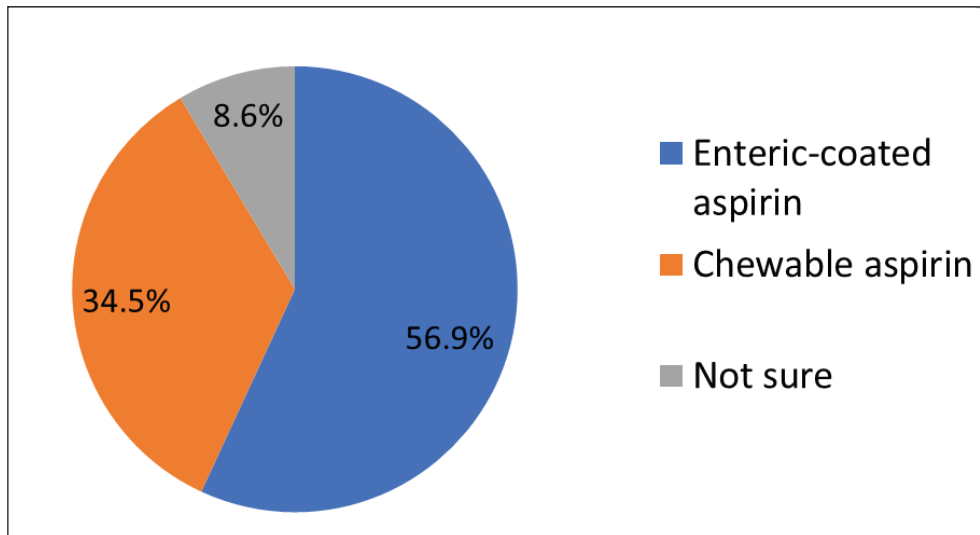


Figure 1. Most commonly used aspirin formulation for acute chest pain.

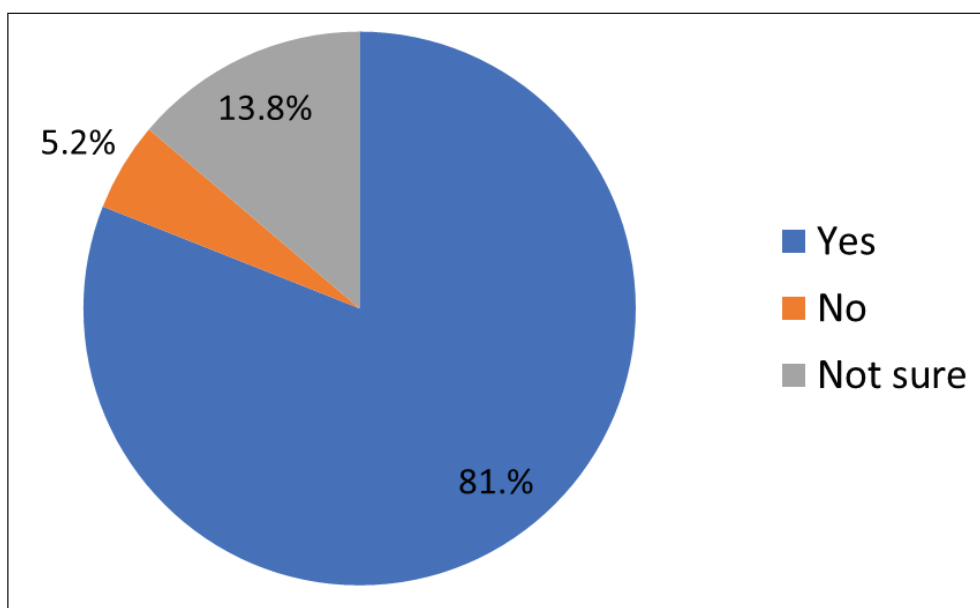


Figure 2. Availability of non-enteric aspirin formulations and willingness to change practice.

enteric aspirin was unavailable than among those who reported that it was available. By contrast, awareness of delayed absorption was not significantly associated with the formulation most commonly used. Although these analyses should be interpreted cautiously because of the modest sample size and exploratory design, it was suggested that availability might be a more important determinant of practice than knowledge alone.

The findings also highlighted an important knowledge gap. While most participants recognized that enteric-coated aspirin has delayed absorption, a substantial proportion believed that chewing or crushing enteric-coated aspirin eliminates this delay. This misconception is clinically relevant because it might lead clinicians to assume that modifying the tablet can compensate for an inherently slower formulation. In acute chest pain, that assumption might result in delayed effective

antiplatelet therapy. Targeted education might therefore be useful, particularly if it emphasized both the preferred formulation and the limitations of enteric-coated aspirin even when chewed or crushed [7].

At the same time, education alone is unlikely to be sufficient. Participants frequently identified limited availability, procurement practices, and habitual use as reasons for enteric-coated aspirin use. These findings suggested that medication formulary decisions and supply processes might have an important influence on bedside practice. In this context, improving access to chewable or soluble aspirin might have a greater practical impact than isolated educational efforts [11,12].

From a health systems perspective, aspirin represented a low-cost, high-impact intervention, and optimizing its formulation in acute chest pain might offer a simple opportunity to improve care quality without requiring

Table 3. System factors, knowledge, and willingness to change practice.

Variable	Frequency (Percentage) n (%)
Aware that enteric-coated aspirin has delayed absorption	
Yes	40 (69.0)
No	10 (17.2)
Not sure	8 (13.8)
Belief that chewing enteric-coated aspirin eliminates the delay	
Yes	25 (43.1)
No	16 (27.6)
Not sure	17 (29.3)
Availability of non-enteric aspirin in the facility	
Yes	19 (32.8)
No	23 (39.7)
Not sure	16 (27.6)
Reasons for enteric-coated aspirin use*	
Only formulation available	25
Habit / routine practice	12
Pharmacy procurement policy	11
Lack of awareness of alternatives	11
Concern about gastrointestinal side effects	9
Hospital or departmental policy	7
Would prefer non-enteric aspirin if available	
Yes	47 (81.0)
No	3 (5.2)
Not sure	8 (13.8)
Support the standardization of non-enteric aspirin use.	
Yes	45 (77.6)
No	4 (6.9)
Not sure	9 (15.5)

Participants could select more than one reason; therefore, responses are not mutually exclusive and totals may exceed the number of participants.

additional infrastructure or staffing [12]. The findings of this study therefore support consideration of system-level interventions such as formulary alignment, procurement review, and standardized acute chest pain pathways that specify non-enteric aspirin as the preferred formulation when appropriate.

More broadly, this study illustrated how variation in practice might reflect the structure of the system in which clinicians work rather than individual decision-making alone. In the Saudi healthcare context, where medication standardization and quality improvement are ongoing priorities, these findings might help inform efforts to align frontline practice with evidence-based recommendations [9].

This study had several limitations. First, it relied on self-reported practice, which might differ from actual bedside behavior. Participants might have described perceived or intended practice rather than observed practice, and social desirability bias cannot be excluded. Second, the

survey used a convenience-based recruitment strategy, and participation was voluntary. Because the survey was distributed through group-based communication channels and might have been secondarily shared, the exact number of eligible clinicians who received the survey could not be determined, and a formal response rate could not be calculated. This also raised the possibility of selection bias. Third, the sample size was modest, and participants were drawn predominantly from the Ministry of Health emergency settings, with emergency physicians comprising most participants. As a result, the findings might not be representative of all clinicians or all healthcare sectors in Saudi Arabia, including private hospitals and other governmental systems.

Fourth, the questionnaire was investigator-developed and, although reviewed for clarity and content validity, it was not formally psychometrically validated. This might limit confidence in the precision of some survey measures. Fifth, reported availability of aspirin formulations was based on participant perception and was not independently verified through pharmacy stock review or procurement records. Similarly, the study did not include direct observational data on medication administration. Finally, the study was designed primarily to describe practice patterns and identify potential system-level influences. It did not assess patient-level outcomes such as time to platelet inhibition, treatment delays, or clinical outcomes. The exploratory associations reported should therefore be interpreted cautiously and not as evidence of causality. Despite these limitations, the study provided useful insight into real-world aspirin use practices and identified potentially modifiable system-level factors that might contribute to variation in care.

Conclusion

In surveyed Ministry of Health settings in Saudi Arabia, enteric-coated aspirin remains commonly used for acute chest pain, despite guideline recommendations favoring non-enteric formulations. This practice appears to be influenced more by medication availability and other system-level factors than by clinician knowledge alone. The frequent use of enteric-coated aspirin, often administered swallowed whole, might represent an avoidable mismatch between evidence-based recommendations and real-world practice. These findings suggest that improving access to chewable or soluble aspirin, alongside targeted clinician education and clearer standardized pathways, may represent a simple and low-cost opportunity to improve medication standardization and patient safety. Further work across a broader range of Saudi healthcare settings would help determine the extent to which these findings apply beyond Ministry of Health facilities.

List of Abbreviations

ACS	Acute coronary syndrome
ED	Emergency department
IRB	Institutional Review Board
MOH	Ministry of Health

Conflict of interest

The authors declare that there is no conflict of interest regarding the publication of this article.

Funding

None.

Consent to participate

Informed consent was obtained from all the participants.

Ethical approval

The study involved an anonymous survey of healthcare professionals and did not include patients, patient data, biological samples, or clinical interventions. Given the minimal-risk nature of the study, it was submitted for ethical review and determined to be exempt from full Institutional Review Board review in accordance with Ministry of Health research ethics guidelines. All data were collected and analyzed in aggregate form.

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